

Impact of Phytochemical Values on the Floral Biodiversity of Shekhawati - A Part of Indian Thar Desert

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ABSTRACT

Shekhawati region is rich with biodiversity which attract the researchers, scientist and biologist. The fauna and flora found in the study area has highly desertic adaptations and are not evenly and densely spread on the land of study area. The study conducted recently when data of Nilgai observed. The region has 120 species of migratory and resident birds of the desert. The chief floral elements in the region are *Prosopis cineraria* (Khejri), *Azadirachta indica* (Neem), *Ficus religiosa* (Pepal), *Dalbergia sisso* (Seesam), *Acacia nilotica* (Desi Babul), *Salvadora persica* (Mitha Jal), *Albizia lebbek* (Sares), *Prosopis juliflora* (Vilayti Babul). The leaves of desert plants are often reduced to spines and thorns to minimize water loss by evaporation. Shekhawati region located in north-eastern of Rajasthan and cover only 8% area of the state. Climatic condition of the area is both extreme – very hot summer and very cool winters. The region lies in semiarid zone with low floral diversity due to scanty and irregular rainfall. Wind velocity in the region is quite high during the summer and sand storms are common feature of the area. Sand dunes are dominant in the entire region especially in northwestern part. The region is part of Indian Thar Desert exhibit little mammalian diversity. During last three decades numbers of large mammals has been drastically decreased in the Shekhawati region due to inference of people in natural habitats of mammals for their beneficiary activities. The mammalian diversity of Shekhawati region is represented by 40 species of mammals belonging to 20 families and 31 genera. The region covers 9% mammalian diversity of India and 58.8.% of Thar.

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KEYWORDS: floral, Shekhawati, Phytochemical, desertic, Thar, beneficiary

INTRODUCTION

The natural vegetation is classed as Northern Desert Thorn Forest (Champion 1936). These occur in small clumps scattered in a more or less open forms. Density and size of patches increase from west to east following the increase in rainfall. The Northwestern thorn scrub forests lie in a band around the Thar Desert, between the desert and the Aravallis. The Aravalli and the south-eastern region is home to the dry deciduous forests, with tropical dry broadleaf forests that include teak, *Acacia*, and other trees. The hilly 'Vagad' region lies in southernmost Rajasthan, on the border with Gujarat. With the exception of Mount Abu, Vagad is the wettest region in Rajasthan, and the most heavily forested. North of 'Vagad' lies the Mewar region, home to the cities of Udaipur and Chittaurgarh. The Hadoti region lies to the southeast, on the border with Madhya Pradesh. North of

'Hadoti' and 'Mewar' lies the 'Dhundhar' region, home to the state capital of Jaipur. Mewar, the easternmost region of Rajasthan, borders Haryana and Uttar Pradesh. All these regions have varied flora and fauna distinct to the region. The Thar, as an ecosystem, is under the process of ecological transformation. This transformation has largely been brought about by the mighty Indira Gandhi Canal and partly through global climate changes. Indira Gandhi Canal water in the Churu and Jhunjhunu district is mainly used for drinking purpose. Because of this Canal irrigation, shadow effects on flora had been observed and 42 plant species of irrigated area have expanded their distribution to non-irrigated area. Uncontrolled mining in mountain range of Aravalli and other small hillocks in Jhunjhunu and Sikar districts are also affecting the floral and faunal

diversity. Changing floral composition will definitely affect the faunal composition of the region. Many mesic species of small mammals are expanding their distribution towards the the Thar. Millet and sorghum are the most important grain staples grown in the Upper East and Upper West regions, and maize, millet, and sorghum are important staples in the Northern Region (Dietz et al., 2004; Gyasi et al., 2008). Yam is an important food crop in the Northern and Upper. West regions (EPA, 2008). Of these crops, millet is the least risky with regard to climateinduced fluctuations in yield followed closely by sorghum and maize, making all of them important for food security. Rice and cotton have much wider variation in productivity year to year. Some farmers also grow vegetables in gardens and irrigated plots during the dry season. Northern Ghana is the most important part of the country for livestock production, giving it an advantage over the south in this regard. Cattle, goats, sheep, chicken, guinea fowl, and pigs are the main animals raised (Dietz et al. 2004, Hesselburg and Yarro 2006). For some agriculturally-dependent communities in the Upper East and Upper West regions, household food security relies more on livestock than on farming (Dietz et al., 2004; Hesselburg and Yarro, 2006; Van der Geest, 2004).

The area under research work was studied by following botanists and time to time viz; first of all the Sekhawati region was touched from vegetational study point of view by Mulay and Ratnam (1950),

Bikaner and pilani neighbourhood areas by joshi (1956 and 1958), vegetation of chirawa by Nair (1956), again Nair and Joshi for Pilani and neighbourhood areas (1957), vegetation of harsh nath in aravalli's hills was studied by Nair and Nathawat (1957), vegetation of Jhunjhunu, Manderella and neighbourhood by Nair (1961), vegetation of ajit sagar dam by Nair and Kanodia (1959); Nair, Kandodia and Thomas (1961) studied the vegetation of Khetri town and neighbourhood areas and vegetation of Lohargal and it's neighbourhood areas of Sikar district by Nair and Malhotra (1961). After the work of Nair and Malhotra (1961), i.e. four decades ago. the area was again left for any sort of further research work in the field of applied Botany. A significant, very authentic taxonomic work was contributed in the field of botany by Bhandari with the publication of a book Flora of the Indian desert (1990). From the field of applied phytogeography point of view. Charan gave a valuable contribution with a publication of a book on Plant Geography (1992). Bhattacharjee (2000) gave a very valuable autheontic contribution through the publication of a book on Handbook of Medicinal Plants in which he presented the medicinal plants of Indian Sub-continental back ground with their coloured photographs also and Sharma (2007) gave a very valuable autheontic contribution through the publication of a book on Medical Plant Geography.

Study Area

Fatehpur is a charming town situated in the Sikar district of the Indian state of Rajasthan. It is a part of the culturally rich Shekhawati region and is conveniently located on National Highway 52, halfway between Jaipur and Bikaner. The town is well-known for its grand havelis (large mansions) that feature intricate frescoes, serving as significant architectural structures of the Shekhawati region). The Fatehpur Beed forest block, covering an area of about 3796.2 hectares, provides a beautiful natural backdrop to the town. Ramgarh Shekhawati, another town in the Sikar district, is also a part of this region and is located at 23.92° North and 73.95° East, with an average elevation of 306 meters (396 feet).



Phytochemical Analysis**Division of Soil Science & Agricultural Chemistry****Rajasthan Agriculture Research Institute Durgapura, Jaipur-302018**

No/Chem/20122/ Dated: 05- 12- 2022

Soil Analysis Report (August- Rainy Season-2020)

S. N.	Name of sample	Ec(dS/m)	pH	O. C. (%) L <.0.5 % M- .5 to .75 H > .75	N(Kg/ha) L <280 M 280-560 H > 560	P ₂ O ₅ (Kg/ha) L <23 M-23-56 H > 56	WHC (%)	Alkalinity
1.	Site I Fatehpur (Surface)	0.43	8.93	0.21	122	22.59	26.64	Alkali
2.	Site I Fatehpur (Depth)	0.63	8.45	0.24	168	31.26	31.50	Saline
3.	Site II Fatehpur (Surface)	0.71	8.11	0.11	58	18.36	26.76	Saline
4.	Site II Fatehpur (Depth)	0.98	8.86	0.13	61	15.43	36.80	Alkali
5.	Site III Fatehpur (Surface)	0.42	8.45	0.36	176	36.24	31.26	Saline
6.	Site III Fatehpur (Depth)	0.40	8.42	0.10	77	18.38	26.65	Saline
7.	Site III Fatehpur (Surface)	0.47	8.62	0.15	95	22.56	22.63	Alkali
8.	Site III Fatehpur (Depth)	0.71	8.38	0.27	136	23.98	28.56	Saline

Floral Biodiversity***Acacia senegal******Aerva persica* (3)*****Boerhavia diffusa******Caesalpinia pulcherrima***

Calotropis procera



Ephedra foliate on Acacia senegal



Capparis decidua



Pedaliium murex



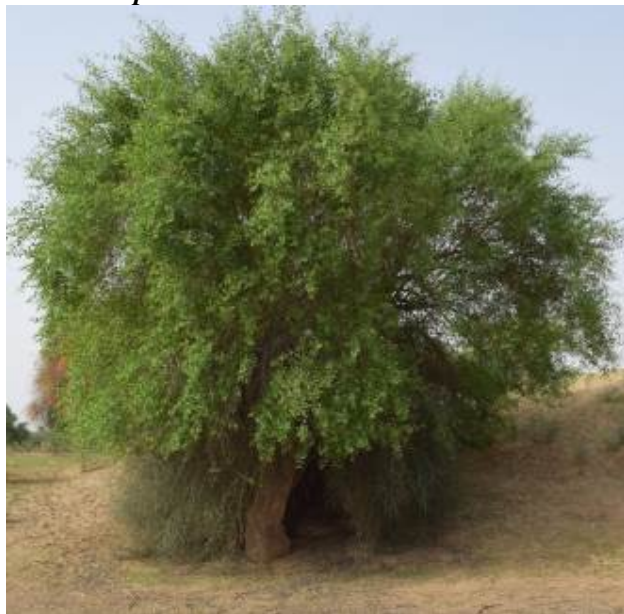
Datura stramonium



Prosopis cineraria



Salvadora persica



Tephrosia purpuria



Ziziphus mauritiana



Solanum indicum



Solanum surattense



DISCUSSION

The Shekhawati region of Indian Thar desert, located in the $29^{\circ}02'$ to $29^{\circ}24'$ north-east part of Rajasthan lies in between $72^{\circ}E$ longitude at a height of about 5° to $76^{\circ}4'N$ latitude and 73 320 meters from sea level. The region covers an area of 27,529.44 sq km and connects with the boundaries of Hanumangarh district in north, Hissar in north-east, Bhiwani, Rohtak and Mahendragarh districts of Haryana in south-east, Jaipur and Nagaur in south and with Bikaner district in west. Not much work has been carried out on survey of existing mammalian species in Shekhawati region of Thar desert. Though, Chakraborty et al. (2005) [18] made a districtwise survey on mammalian diversity of Thar desert. Present study is largely based on our observations in the field during recent times. For this, the area was divided into three parts based on its ecophysiological characters viz 1. Middle-eastern part of the Shekhawati region - Plain agricultural area 2. Southern-eastern part of the Shekhawati region - Arawali mountainary range, its foothill site and small hillocky areas. 3. Northwestern part of the Shekhawati region – Thar desertic area. The Mammals of the region were monitored all the year round, during all the seasons. During study period minimum one site was visited per month to record the mammals and their related parameters. Total 84 sites were visited in the study area. During

field survey of mammalian species both direct and indirect methods were used. Following methods were applied: The Shekhawati region of Indian Thar desert, located in the North-East part of Rajasthan lies in between 27° 24' to 29° 02' N latitude and 73° 4' to 76° 5' E longitude at a height of about 320 meters from sea level. The region covers an area of 27,529.44 sq km and connects with the boundaries of Hanumangarh district in north, Hissar in north-east, Bhiwani, Rohtak and Mahendragarh districts of Haryana in southeast, Jaipur and Nagaur in south and with Bikaner district in West. Cross winds, dust and sand storms are common in the area which results in annual changes in the topography of the sandy habitats (Joshi and Sharma, 1964). Drought and famines are very common, but climatically the area is not a true desert (Stein, 1942). During the study period extensive survey work was conducted in different villages of Shekhawati region. Animals were followed for regular observation and protocols were recorded for scan and ad libitum sampling (Altman, 1974). The observation carried out by the aid of 10x50 binoculars and data was supported with photography using Nikon P510 42 X zoom.

As the nature of the research work, it becomes the prime most duty of a phytogeographer to trace out to identify the plants and then their geographic interpretation from their origin point of view, their cartographic presentation from spatial distribution point of view and lastly also to prepare their layout planning map for on going plantation programme at least for the applied plant species for the area under study. Naturally, the present study will cover the present position of phytogeographic pattern of spatial distribution of applied plant species, so a phytogeographer can propose their allocation of sites of coinciding habitats from their conservation point of view for the welfare of future generation of the area under study. we can conserve those plant species which have their applied values for the welfare of human beings inhabiting in that particular area or the area under study. for this purpose, a phytogeographer has to give an account of the layout maps of that area under study which covers the allocation of the sites with favourable habitats according to the nature of the existing applied plant species for the area under investigation.

6. Methodology : The present study has been substantiated by extensive field work. The essential data have been collected from a wide range of sources. The remote sensing available data have been used. Survey of India topo-sheets for the entire region and a bioclimatic map, have been used as base maps. Additionally, data from reports, maps, pamphlets, research papers, books, monographs, soil survey data, forest survey data from published and

unpublished materials have been collected from different agencies. After examining the remote sensing and other data related to physical (climate, soil, land forms and water) biological (flora and fauna) and social (population dynamics, economic activities land use and productivity) indicators, a few survey sites were located. The sites were visited during field survey. To illustrate the frequency of distribution of particular plant species the prescribed method of Raunkier's will be exercised to show whether the particular plant species is rare, frequent, common or abundant for the area under investigation. The nature of habitats and the eco-climatic conditions will be dealt as a part and portion of the study to support the phytoclimatic account of the research problem for the area under study. From phytogeographic study point of view, a cartographic interpretation of the multi-purpose plant species will be dealt at two levels i.e. at macro-level and at microlevel, basically it may be dealt phytogeographic sense.

OBSERVATIONS

BOTANICAL NAME : *Adhatoda vasica* **LOCAL NAME :** Arusa, Ardoo, Ardua (Plate : 1.1).

(A) VEGETATIONAL CHARACTERISTICS : The plant belongs to the family - Acanthaceae. From vegetational group point of view, the plant belongs to the group of "Tree", it is a medium sized tree, in nature some times it is also observed in the form of shrub. It is tall, much branched (branches are terete) and mostly evergreen tree. The leaves of the plant are lanceolate, large and dark green in colour. From leaf-class classification point of view the plant falls in 'Micro-phylls' class (i.e. 12 to 20 cm. long and 2.5 to 0.5 cm in width). The leaves have some characteristic odour and bitter in taste. Leaves margins are crenate and apex is acuminate with glabrous surface and smooth texture. From life-forms point of view, the plant falls in the group of "microphanerophytes". It's flowers are dense and white in colour with purplish markings. It's fruit's are capsular

B) ECO-CLIMATIC CONDITIONS AND HABITAT : The plant has favourable annual average rainfall condition in between 40 cm. to 150 cm.. From temperatures variation point of view-it's favourable range lies in between 10° c mean monthly minimum to 40° c mean monthly maximum, respectively. The plant needs good moisture conditions, dry winds are harmful for it's growth and development. Plant's favourable habitats are sandy plains, gravel formation with compact soil, and also some times the rocky places. Thus, it is observed frequently in semi-arid climate, it is quite common in sub-humid climate and humid climate. It's plantation is very common on

both sides of routes of roads at many places, it is also observed frequent to common on the places which fall under waste - lands in Shekhawati region.

(C) PHYTO-CHEMICALS OF PARTS AND PORTION : The leaves contain very small amount of essential oil and quinazolin alkaloids (0.5 to 1%) such as vasicine and vasicinone. The roots as well as bark of the plant is also found to contain alkaloids, in addition to the alkaloids, it contains, yellow colouring matter and vasicin a non-nitrogenous crystalline substance. The plant's phyto-chemicals are also studied by Kanwal et al. In 1983 on seasonal variation of alkaloids.

(D) MEDICINAL APPLIED ASPECT : The plant has some significant medicinal applied aspect in the cure of some disease viz; in Asthma, in Bronchitis, in Cough, normal Fever, Pneumonia, Orthodox as a native medicine. The plants parts are boiled in water and used for bath in the treatment of body inflammation and bodyache. The leaves decoction is administered in cough and chronic bronchitis. Thus, it is used as an expectorant, bronchodilator and as mild bronchial antispasmodic, vasicine is reported to possess oxytocic action. Vasicine is reported to be bronchoconstrictor, whereas its autooxidised form vasicinone is a bronchodilator.

PHYTO-GEOGRAPHICAL DISTRIBUTION OF *Adhatoda vasica*

A. At Global Level : At global level, the plant is native to Oriental floristic region by covering following countries in the world - Ceylon, Burma, Malaysia, and throughout India. In India, it is commonly found in Chhindwara district of Madhya Pradesh, at Chhindi and Chintipur and also occurs throughout the plain and sub-mountainous regions.

B. At Regional Level : As shown in figure that the plant has rare phytogeographic pattern of distribution in Rajgarh and Taranagar tehsils of Churu district. Besides this, the plant has rare distribution in the areas under hilly patches of Shekhawati region. Churu tehsil of Churu district; Fatehpur, Lachhmangarh, Sikar tehsils of Sikar district i.e. western portion of Sikar district, and most of the tehsil of Jhunjhunu and Chirawa, Buhana tehsil and Nawalgarh tehsil of Jhunjhunu district it shows common occurrence, respectively. Whereas the plant shows frequent occurrence of phytogeographic pattern of distribution in the eastern parts tehsils of Sikar district, and most of the parts and portion of south-eastern located tehsils of Jhunjhunu district i.e. Khetri and Udaipurwati, respectively. No where an study area it was observed as an abundant locality, thus, no pure

association of this plant was observed; although on road side plantation, the plant shows its frequent occurrence at many places of Shekhawati region. The plant also shows no occurrence on the top of sand dunes habitat as well as on hilly habitat.

RESULTS AND CONCLUSIONS

Owing to strong variation in climatic, edaphic, physiographic, topographic and geological characteristic, the Shekhawati region of Rajasthan shows a wide diversity of habitats. The fauna and flora found in the study area has highly desertic adaptations and are not evenly and densely spread on the land of study area. Climatic conditions of a region have a great deal to do with the increasing population and distribution of fauna and flora. It is the area of good numbers of animals, trees species and different habitats, mapping it a unique ecological zone (Singh, 2007). The area can be classified into Sub-humid region based on climatologically data and the occurrence of reptiles. Animals: The region is a haven for 120 species of migratory and resident birds of the desert. One can see eagles, harriers, falcons, buzzards, kestrel and vultures. Short-toed Eagles (*Circus gallicus*), Tawny Eagles (*Aquila rapax*), Greater Spotted Eagles (*Aquila clanga*), Laggar Falcons (*Falco jugger*) and kestrels. A total of 130 species belongs to 92 Genus, 33 Families and 15 orders were identified during the study period (Dubey and Shyoran, 2011). Natural vegetation i.e. *Adhatoda vasica* degradation is taking place in shekhawati region through irregular rainfall, public interfere, wind erosion, water erosion, high temperature, storms and soil erosion. These processes have been accelerated by increasing technogenic and human activities it has resulted in the degradation of *Adhatoda vasica* of the region due to irregular rainfall and wind erosion and high temperature are more serious and widespread. Overgrazing and indiscriminate felling of under shrubs resulted in the degradation of vegetation cover and decrease in biomass production. In case these problems continue uncontrolled, large acreage of forest area will be affected in future. The results suggest to take up immediate steps to adopt the improved forest management technologies with people's participation to lack of effects of decrease of natural vegetation in the region but it is not possible to conserve completely. Further the results of the study could be fruitfully utilized by the planners biologists, botanists, phytogeographers, naturalists and policy makers to evolve suitable forest management technologies and strategies commensurate to the bio-conditions of the region.

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